

TPM Volume-9

Total Preventive Maintenance

Prevention of Scattering II

2019b Edition

Koichi Kimura



Factory Management Institute

COOPERATING TO REACH EXCELLENCE



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Icons:



Notes: Going and Comeback to the main theme.



Third level of the Issue, in order to provide more clearness to the structure of the text.



Lower levels of the Issue, commonly 6th or 7th And, pointing out necessary explanations about pictures or graphs.

UPDATING TABLE:

Date, Version-Previous & V-Next	Chapter (I..XX...)	Chapter Point.- sub-point : (Updating)

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I. Introduction

When doing my job, I always, make questions and confirm customer's requirement. What customer's requirement is. Why the customer require it does.

In this column, I'm writing a teaching to a client company. This company wished to introduce TPM (so called Total Productive Maintenance).

And in the initial discussion, we confirmed and agreed the wishes of this company which was anyway cost reduction for profit recovery.

And the project team claimed even if this company could succeed to introduce TPM, it wouldn't be able to reduce cost.

Yes, they declared that TPM introduction couldn't affect to the cost reduction. No, it is possible to improve cost in just area of defect reduction related to machine process, but very limited. And, even if machine capacity is improved, it is not possible to contribute to cost reduction, if the output which is sales amount wouldn't increase. And if this company wished to improve cost, it was required to raise sales amount or reduce excess machine & equipment capacity and labour capacity.

The project activity was constituted of the project members and Gemba committee. Therefore, the project needed to avoid the idea of excess labour capacity reduction.

By the way, there are serious contradictions.

Wish to implement TPM. But there is an essential item which is Jishu-Hozan (Autonomous Maintenance) which is same mind to Kaizen. Therefor a cooperation of Employee is absolute condition.

Nowadays the word of employee engagement is highlighted. It is the base of "*Share the sense of value*" and "*All people's participation*".

A company wishes to introduce TPM or TQM, TPS, **Kaizen** in the theory of corporation. On the other hand, it is necessary and required to think from the point of view of the side of employee's theory.

TPS, TQM, TPM, Kaizen or Japanese Factory Management are in the balance of both sentences.

Long days I put forward and use the word of 3S which are Customer's Satisfaction, Society's Satisfaction and Employee's satisfaction. And nowadays employee engagement is a crucial factor for corporate development based on "Employee's Satisfaction".

Consequently, this project got a deadlock.

The top management requires the reduction of excess labour capacity. Because the first priority is to recover profit for corporate survival. It is a thought from the side of corporate theory.

And the project members who were like employee's representatives denied the dismissal of any employees to keep "Share the sense of value and all people's participation".

TPM introduction was required. But Employee cooperation is essential to introduce and maintain TPM.

Cost reduction was required. But any excess labour capacity reduction was denied, because of damaging the relationship with employees.

What would you do?

*Koichi Kimura
International Consultant
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(II. Valuable & invaluable Muda

New era name and...

Before going to this theme please accept to introduce Japan. Because Japan had very special time at May 2019 when is the start of Reiwa era name. And in this description, I would mention my concern regarding the world swept by money economy incidentally.



Money economy.

I have a concern about the world swept by excessive money economy. And, in this theme again I would describe Muda also.

I teach rational things to seek better cost performance. I have no choice but to do, because it is my business. How to reduce or eliminate Muda in process to seek better cost performance. Muda, Muda Muda...

But a little let us stop once and think Muda.

We regard about Muda from the point of view of Money economy.

In somewhere I have written that "is Muda evil?" As you know definition of Muda is:

- Any activity or status which consumes resources without creating value. Or,
- Any activity or status which no adding value to products.

Is it true that no adding or no creating value is Muda (Waste)? ...Yes, it is correct if looking at the things with through the view point of money economy.

What is Muda? ...Conversely, what is something of value? ...And let's consider a thing from the point of view of not money economy. I would think about this matter in this column.

Why I write such thing is that I'm concerned about the wind tide of excessive money economy. My professional field is to reduce cost and seek benefit in-house. Then I teach TPS, TQM, TPM, Kaizen and Factory management. And, I always teach Muda to be evil. Again, it is quite true if we look at the thing with through one filter. What the filter is. This is theory of Money economy and market economy.

I feel sorry and worry about this biased current and, I think that all things are judged with money and economy excessively in this world. But all things shouldn't be judged with through the theory of money economy.

And for your better thought, I would describe this column with Japanese examples.

I believe you have same things which should be kept with cost even though it is seen as Muda in the sense of value of money economy.

I don't know your case. But I believe there are many such things.

A tomb was certificated as world heritage.

As you know there is Imperial family in Japan. And this Imperial family is continuing more than 2600 years (actually 2679 year at A.D. 2019. Source: KO-JI-KI)

KO-JI-KI: Japanese oldest history record. Edited at 712 A.D.

As the example to consider Muda, I would use the Imperial events which are very far from secular. As an aside, recently there was a very much sorry thing.



Figure 1: Picture from: <https://osaka-info.jp/en/page/tomb-emperor-nintoku-daisen-kofun>

The above photo is the Emperor tomb of Nintoku Emperor. It is very large: L: 486m x W: 249m x H: 35m. Established: Middle of 5th century. Nintoku Emperor: The 16th Emperor.

This Emperor tomb was registered as a world Heritage. Then the people of Osaka were glad this certification. And say that it is quite good chance to bring up and thrive the tourism business.

I really disappointed. This a tomb even though very old. And again, this isn't remains like as Egyptian pyramid, but tomb. And despite it is holly place, the wind tide of general people is welcomed this certification as a resource of tourism.

This is bad example of everything to be judged with money economy.

This tomb is under the control of Imperial Household Agency. I think something wrong.

The wind tide of money and economy.

We find out and seek the value in money economy.

For instance, my living location is countryside. I can see mountains and field. Now green rice fields spread and beautiful. However, people look the nature as the value in money economy. And then, the people's concern is always how many harvest amounts in one hectare.

There is a countryside where my family visits almost every year and many years (almost 30 years). Initially this countryside was beautiful with the unspoiled nature and hot springs. And gradually tourists increased and also hotels and Japanese **Ryokans**¹ increased. But after the boom was over and particularly after the Bankruptcy of Lehman Brothers, many hotels and **Ryokans** became ruins. And these ruined hotels began to harm nature. Sad. It is indeed sad.

What the value of nature is? ...Nature is beautiful. But unfortunately, the wind tide measures the value in the harvest amount and tourism resource. I mean the money economy.

A little away from above countryside there is a village in unspoiled nature. The **Soba**² restaurant is run business by an old couple. My favourite is to eat his soba with looking down at the mountain stream.

According to the talk of old couple, recently foreign tourists and young backpacker increased in this area. And customers of soba increase.

I said them that —It is good to increase your business, isn't it? ...But their response was unique and said —Business increase? ...No, it is not. We harvest soba. And we eat and sale it. The quantity of sale is limited —and they continued...

—When sold out, we shut down restaurant. When to be in excess, we eat it or give to neighbours. Increase business? ...No, we don't want. —and later they asked figuratively— Nature? ...Nature is a part of our life. No, it is wrong. We are a part of nature.

Why foreign tourists and young backpackers visit this countryside do? ...Probably they wish to become one with nature. And, probably they wish fleeting well-being and peace with nature.

Their mind is pure. And, probably they wish to repair and maintain the balance of mind.

But on the other hand, the wind tide of money economy comes up with the tourism resource.

I hope money economy doesn't contaminate this nature. I never deny money economy, but have a concern of excessive trend.

¹ **Ryokan:** Traditional Japanese holiday inn.

² **Soba:** Japanese noodles made from buckwheat flour.

Traditional technology.

Now there is one of difficulty in traditional technology. One of example is Japanese **Washi**³ (Japanese paper).



Figure 2: A process of *Tesuki Washi* production. *Tesuki; Handmade.*

According to **KOJIKI**, the history of paper is transferred at 285 years from China. And the method was taught by the people from overseas especially from Korea at the age of middle of 5th century.

When looking the history, it came from China, but the technology remains just in Japan. Recently Japanese Washi was certificated as Intangible cultural heritage by UNESCO. However, this traditional technology is disappearing, because of no successors and because of economic reason.

Washi technology is really important and must be passed down. But I sadly to say that it is disappearing, because the technology itself isn't evaluated in the sense of value of money and economy. And in the world of money economy, such even important traditional technology is required to leave from the market in the rule of it.

Today's society is that if it cannot get a profit, it should leave from the market. But, please stop and think.... So, is the standard of value just money and economy?

³ **Washi:** UNESCO designated the traditional elaboration of Japanese washi as Intangible Cultural Heritage of Humanity on November 26, 2014.

An Invaluable Muda.



Era name: REIWA-era.

When writing TPM-7 (previous issue to this dedicated to the prevention of scattering), Japanese celebrated the new era. This year 2019 is a special year for Japanese, because the era name was changed from HEISE to REIWA.

Japanese era name has very old history and it goes back to A.D. 645 and is continuing more than 1300 years.

If looking at the world, the Anno Domini, the Islamic calendar, the Buddhist calendar, etc. are widely used as a measure of time. These are the eras, which are different from the original era, which is changed by the change of the monarch, and it is a chronology that counts the years with a row of numbers starting from the death of a religious leader. Era name was used in Japan, China, Korea, Vietnam and other some countries. And, the root is China.

But at present just Japan is keeping to use it. And, at present, the era name is REIWA.

When I was writing the TPM-7, the new era name was published at May 1st 2019.

At this time HEISEI Emperor (Akihito) transferred the position to new Emperor (Naruhito) and the era name was also changed as REIWA (令和).

REI (令): Beautiful.

WA (和): To be warmed. Harmony.

REIWA: Beautiful harmony. Culture is born and nurtured in people to be warmed and harmony.

All of Japanese (it is indeed all of Japanese) congratulate the new era name and also new Emperor. So, Japanese could have twice happy New Year. May 1st is REIWA New Year.



Era name

Why Japanese use era name does. It is Muda. Because it is quite general to use A.D. in the world. Japan also of course use it. But Japan uses era name also.

It is indeed Muda. My birth era name is SHOUWA. And it is needed to exchange A.D. with adding 25 year. (SHOUWA 1st year is 1925-year A.D.)

Era name is used in all Japanese government office. It is rule.

When changing era name (of course not so many occasions), it is necessary to change and adjust all computing system. At this time calendar maker had troubles. Because the notification of new era name was just before to the new era (REIWA).

REIWA era stared at 1st May 2019. And, the official notification was made at the 1st of April 2019.

Era name change is not just its name, but other national holidays also are changed. (for instance, Emperor's birthday.) If just A.D. there is no such troublesome.

Therefore, it is indeed Muda.

When I was in UK (SHOWA era), I thought it is indeed Muda. But within unaware, my mind has been changed.

Now Japanese has a proud this culture which exists in just Japan and is continuing more than 1300 years.

For instance, when you talk about a certain era, how do you talk? ... For instance, in Japan: The era when I was young is SHOUWA. And, SHOUWA era was poor but good. We feel nostalgia to SHOUWA era.

After being in HEISE era, the world trend became to be rapid and busy. Of course, Japanese uses A.D. also for reminiscence and says: "In the 1940s..." But for reminiscence, Japanese uses era name in the overwhelmingly many cases.

Nowadays. That's era. My young era... And, when talking age and period, era name harmonizes to mind. Era name shows one of Japanese identity and deep culture.

If judging with the theory of money and economy, it is defined Muda. However, Japanese maintains this Muda as an important culture.

Ise Grand Shrine regular renewal.



In here, I introduce one of biggest invaluable Muda in Japan.

I believe you know the name of **Ise Grand Shrine**⁴ which is the root of Japanese and deifies the Emperor family's ancestor. This Grand Shrine carries out the event which whole Shrine is renewed, so called **Go-Sen-Guu**, every 20 years as a Shinto event. And not only the temple, but also many small shrines (22) in the area and the wooden bridge and the guard frames, so called **Torii**, are renewed.

The area has 5500 hectares including the forest and 22 small shrines.

In addition, costumes such as clothes to be worn at the time of the decoration ceremony of the interior of the main temple, sacred treasure such as armours and musical instruments are also newly made by selected craftsmen.

Recently (2005~2013. In 8 years) this Shinto event was carried out with the cost of \$500 million. And during the renewal in 8 years, 33 kinds of Shinto rituals are implemented.

This event was held at A.D. 690 year and this time was the 62nd time. There was a case of postponed at immediately after the war. But it has been continuing more than 1300 years.

Why renew every 20 years? ...

⁴ **Ise Grand Shrine:** https://en.wikipedia.org/wiki/Ise_Grand_Shrine
https://es.wikipedia.org/wiki/Santuario_de_Ise

In front of the temple gate and final guard frame (Torii):



Figure 3: Stairways leading to the Main Sanctuary. By N yotarou - Own work, CC BY-SA 4.0, <https://commons.wikimedia.org/w/index.php?curid=39966689>



Figure 4: Horyuji-temple By Martin Falbisoner - Own work, CC BY-SA 4.0, <https://commons.wikimedia.org/w/index.php?curid=53650101>

By the way, the oldest wooden historical building in the world is Horyuji-temple (Buddhism) in Nara Japan.

This is more than 1300 years old (Established A.D 607 year).

Of course, this is well maintained and never re-building like as Ise Grand Shrine.

Again, Ise Grand Shrine is renewed every 20 years.

Is it Muda? ...Because there is no damage and there is no reason in the maintenance issue.

Checking out the reason. Why it is necessary? ...

- Tradition of ancient technology: Yes, there is such purpose.
- Resource of tourism: No.
- Industrial development: Of course not.
- Act of person of authority: No.

Why renew with enormous cost? ...There is no certain record. But it is thought that "to keep and continue" the spectacular event is important.

This Invaluable Muda is contrast to the theory of many economy. This investment doesn't create the value in money economy.

Money economy doesn't find the value in (for instance) a nature itself, but find the value in the product (for instance tourism resource or harvests) which the nature produces.

For instance, technology also, technology itself has no value, but is fined the value in the product which is produced with it in money economy.

And sadly, today's society requires that if it cannot create benefit in money economy, it must out from the market.

I teach what is Muda, Lean, and Industrial Engineering to eliminate Muda and seek rational methods. And I think that a certain level of rationality in money economy is necessary. But... On the other hand, I think that this excessive partiality to just money economy is wrong. The result of excessive money economy creates tremendous income gaps and social unrest.

I feel the danger of money economy in the people's mind of World Heritage certification of the Emperor tomb.

On the other hand, I feel the peace in such Shinto events. In these Shinto events, (for instance) there is a special event so called **Daijou-sai**.

Daijou-sai.



Figure 5: *Daijou-sai*. By 外務省 Ministry of foreign affairs - http://www.mofa.go.jp/s_sa/sea2/ph/page3e_000441_2017.html, CC 表示 4.0, <https://commons.wikimedia.org/w/index.php?curid=69506960>

The purpose of this event by Emperor is to pray the peace of people. Emperor holds the event of praying people's peace every year. And, it is called ***Niiname-sai***. But when changing Emperor, this ***Niiname-sai*** is called ***Daijou-sai***. And it is held at midnight.

Daijou-sai is an imperial event accompanying the replacement of the Emperor.

This is a ceremony by the Emperor to offer new grains to the gods for the first time after the throne, and to eat together to pray for the richness of the five grains and the peace of the country and 1300 years ago, it is supposed to have started from the **Tenmu** Emperor of **Asuka** period.

At this time, accompanying with the throne of REIWA Emperor, it will be held at November 14th 2019.

To make this ***Daijou-sai***, it is necessary to prepare. And one of preparation is the establishment of ***Daijou*-palace**.

For construction of temporary palace which is constituted of big and small 40 constructions in 90meters square in East **Gyoen** of Imperial Palace. These constructions are removed after the ***Daijou-sai*** ritual.

The total cost is planed about \$14 million.

Now, after the ritual these temporal palaces are demolished. Also as wrote above, this Shinto ritual isn't open to the public.

Is this cost some kind of Muda? ...As I wrote before, now is the world of REIWA in Japan. And for the Imperial succession it is necessary to carry out many events which are not open to the public and also are implemented in secretly and solemnly with using very special language (ancient language, language of **Nara** period).

Now I'm writing Invaluable Muda. And, why such Muda, **Ise** Grand Shrine renewal, Imperial events Japanese do.

I think it is not just Japanese, but any countries do similar things. I think human beings find and seek a peace in stability.

And people find and seek peace and stability in unchanging. Politics, Economy, Technology ... These are changing constantly. It is indeed that the world is changing rapidly. Therefore, people feel peace and stable in unchanging.

Unchanging such tradition of **Ise** Grand Shrine renewal, use of era name is true opposite to the theory of money economy. And, most of Japanese doesn't hesitate to pay the cost to unchanging or the things which must be never changed.

Again, wind tide of money and economy. And recently there is additional wind tide...

When I travelled to a countryside, I came across very strange scene. It is indeed strange. I met a foreign young couple. They came from New York of United States.

And, in the countryside, there is a hot spring which is used by local persons. I like this hot spring. And traveling this region, I always enjoy this hot spring. I met him in the hot spring

I wrote that this excessive partiality to just money economy is wrong. And, to pay cost to unchanged or things which must never be changed is Muda? ...No, I don't think so.

People gets peace and stable against the investment of this cost. Therefore, I call such events Invaluable Muda.

Again, I never deny the importance of money economy as a linear measure of wealth. But now it is excessive. And, we need to consider that we live in many Mudas. Yes, it is not an exaggerated expression. Then we can balance and maintain the mind harmony.

Now it is the era of AI. AI cannot feel peace & psychological stable. And, unfortunately, in the acceleration of AI, this phenomenon is more noticeable. And to keep balance in mind, I think this investment to invaluable Muda is important and essential.

To pay costs to peace and stable is never Muda.

I believe that there are many things of unchanging or things which are required to preserve in your country. Another word, it is not exaggeration that we live in and are surrounded by such Muda.

AI? ...People is required to use it and complement the lack of it. Therefore, invaluable Muda which is out of money economy is important.

III. Scattering prevention

Forced degradation and Natural degradation

In the last edition, I wrote next word:

I have been taught the words of "Forced degradation and Natural degradation" by a company long years ago (1980s). And the teacher told me that most of root causes of the machine troubles are the "Forced degradation".

His word of "most of..." might be exaggerated. But it might be true that scattering is one of serious root cause of machine troubles.

Again, I explain the word of "Forced degradation and Natural degradation".

A machine degrades if it is used. It is quite natural. But in the condition of use, the degradation speed relating to its lifecycle is quite different.



Natural degradation

Even if the machine is used correctly, the parts are physically worn if they rub against each other. And when the time comes like this, it will be said that natural degradation will progress.



Forced degradation

On the other hand, degradation that occurs due to not doing what should be done, such as not cleaning the part to be cleaned, not oiling where it should be done, or leaving it with overload and rattle, it is called forced degradation.

If there is no cover to stop dust and dirt from being scattered locally, it will forcibly deteriorate important functions of the machine and cause breakdown.

Again, the deterioration was promoted because of course not doing what should be done.

It is important to create local covers with the wisdom of circle activities, etc., and change them to natural degradation.

Recognizing forced degradation.

It is quite important to pay attention and recognize the causes of forced degradation.

How? ...I believe you remember next table which I introduced in TPM-6. And based on this table you can understand the condition of forced degradation of your machine



What is "The Abnormalities"			
Items		Abnormalities	Detail of abnormalities
1	Small defects	Dirt	Dust, Trash, Powder, Rust, Oil, Paint
		Scar	Crack, Crush, Deformation, Chip, Bend
		Rattle	Shaking, Come out, Title, Decentration, Wear, Distorted, Corrosion
		Looseness	Bolt & Nut, Gauge, Cover, Belt, Chain
		Abnormality	Noise, Heat, Vibration, Smell, Discolouring, Pressure, E-Current
		Adhesion	Clogging, Fixation, Deposition, Peeling, Operation failure
2	Regarding fundamental conditions	Oil & Lubrication	Oil shortage, Oil dirt, Unknown oil spades, inappropriate oil, Leakage
		Oiling	Oil of oil filter port, Clog, Break, Deformation, Pipe crush, Storage condition, Oiling equipment defect
		Oil level gauge	Dirt, Crush, Leakage, Defect of Level indication
		Retightening	Looseness of bolt & nut, Dropout, Hooking defect, Too long, Crush screw, Corrosion, Defective washer, Volt indication, Reverse double nut
3	Difcult Places	<i>Seiso</i>	Machine construction, Cover, Placement, Foothold, Space
		Inspection	Cover, Construction, Placement, Meter position, Direction, Appropriate display
		Oiling	Oiling mouth position, Construction, Height, Foothold, Waste-oil mouth, Space
		Rethigting	Cover, Construction, Placement, Sice, Handle position, Space
		Operation	Machine placement, Valves, Switch, Handle position, Foothold
		Adjustment	Position of Manometer, Thermometer, Flow Meter, Moisture meter, Vacuum gauge
4	Source of dirt	Products	Leakage, Overflow, Burst Out, Scattering, Spilling
		Material	Leakage, Overflow, Burst Out, Scattering, Spilling
		Oil	Overflow/Bleeding of Lubricant, Hydraulic, Processing, Fuel oil
		Gas	Leak and Scattering of Air, Gas, Steam, pH (Acidity), Exhaust
		Liquid	Overflow, Bleeding of Water, Hot water, Semi-finished product, Cooling water, Drainage, Circulating liquid
		Processing	Burr, Cutting waste, Packaging material, Spatter, Fire flush, Smoke, End material, Adhesive, Paint, Oil, Light, Polishing powder, Defective products
		Others	by Person, by Forklift, intrusion from clearance of building

Going back to the theme of scattering prevention and local scattering prevention cover...

Important points of local scattering prevention cover.

Here, let's cite the points of local scattering prevention in "wet processing machine" where a large amount of chips and coolant is scattered.

1. First, is the coolant concentrated on the cutting point?
If it is not applied to the cutting point, the life of the blade will be shortened, the finished state of the workpiece (surface roughness, etc.) will be worsened, and the scattering of the coolant will get worse.

There are many cases where it isn't to be poured it unexpectedly, so you have to observe and confirm.

2. Grabbing the direction, angle, amount and speed of scattering.
3. Whether there are problems in workability and safety depending on the shape and size of the local cover to be built.

Let's make local scattering prevention cover.

If you plan to buy and install new machine, a scattering prevention cover should be considered and set up before start to use. I call this activity "**Advance 5Ss**".

I have written in somewhere that do not use the machine just bought as it is. And it is necessary to put in necessary devices such IoT devices, material supply, unloading, preparation of working circumstances. Such preparation for new machine just bought is important. And in this preparation, please add the consideration and build in the local scattering prevention under the name of **advance 5Ss**.

Now, if you have machines already and need to put in a scattering prevention cover, it is necessary to make next kaizen approach.

The step is easy.



1. Above 3 points (1-2) are the first.
 - a. First, is the coolant concentrated on the cutting point?
 - b. Grabbing the direction, angle, amount and speed of scattering.
2. Making tentative and trial cover with easy material such plastic plate or cardboard.
3. Confirm the third point (3)-3. Workability and safety. And,
 - a. Trial and error.
4. Decide final shape and material and setup.
5. Then Standardize.

Please don't forget that scattering prevention also is involved in **Jishu-Hozan**.

The operator who uses the machine best knows the condition of chips and coolant from the machine. Therefore, when creating a local cover, it is important that the operator himself / herself cuts and pastes (for instance) cardboard and tinplate. But don't intend for something perfect from the beginning, you will run out of breath later. Never rely on the help of staff. It is important to make it in an operator group. Furthermore, it is desirable to use the "*reflective opportunity and improvement opportunity*" process, which uses hand-made items, repairs the troubles, and if there are no problems, turns them into final shape and material.

There are two types of topical covers in terms of their shape. Both stops scattering **near the source**.

One is a "shield plate type" cover that applies a single plate or multiple plates locally. This is a cost-effective improvement that can be done immediately.

The second is a compact, "box-shaped" local cover made by minimizing and localizing the conventional large scattering prevention cover. It costs a little, but the effect can be expected unexpectedly. There are many ways to make it, but it is required the wise and perseverance. The

material of each local cover is first tried with such corrugated cardboard or tin plate, and later made permanent with PVC plate, rubber plate and iron plate.

Some Examples

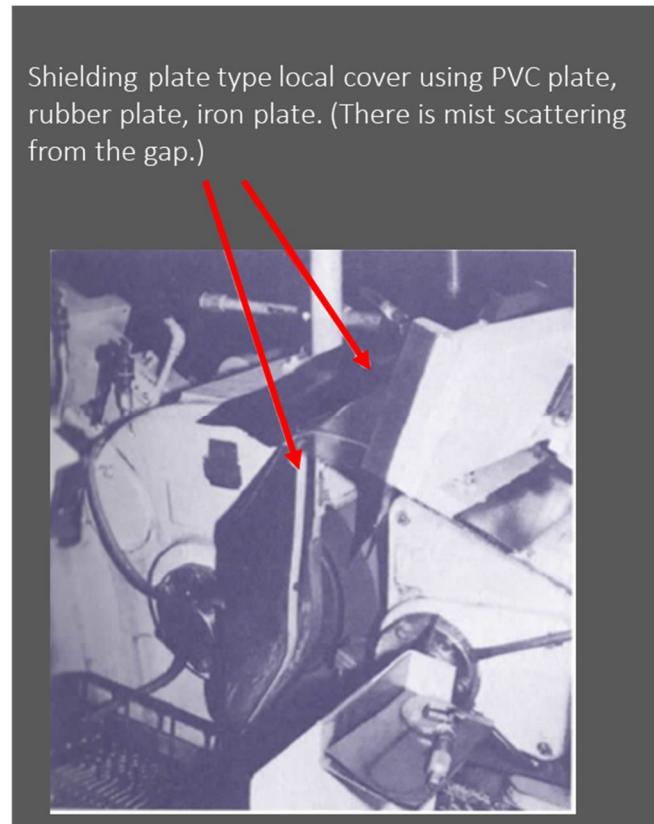
Unfortunately, I don't have good photos. Therefore, I use very old photos which I was given by the teacher long years ago ('more than 40 years ago). So, there may not exist such machines. But I believe you can understand the image of local scattering prevention cover.



1. A grinding machine.

This grinding machine with automatic feeding device has a narrow space between the grinding wheel and the feed wheel, and also it is necessary to apply a large amount of grinding oil.

Therefore, it was difficult to localize in order to prevent scattering, and at first, a "shielding plate type" local cover that can be easily and easily installed was installed.

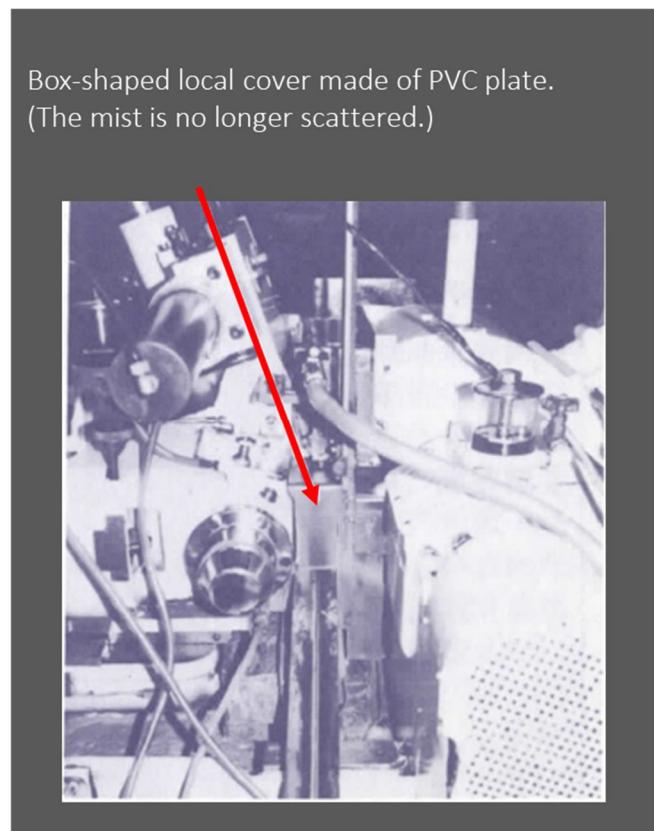


Shield plate type local cover

However, since there was still a lot of mist scattering from the gaps in the shielding plate, when observed it closely, the grinding nozzle used a plate type with a mouth opening, so it was not poured on the cutting point and there was a lot of scattering.

To improve it, firstly the grinding nozzle was changed from plate type to several pipes' nozzles.

And, the plate type covers were changed to box type cover (the photo below).





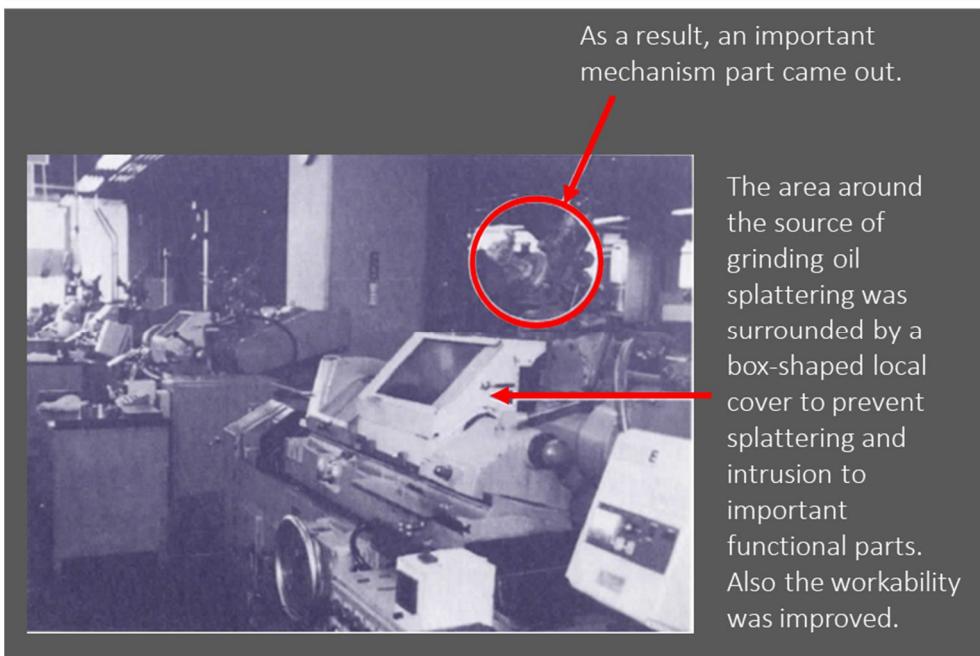
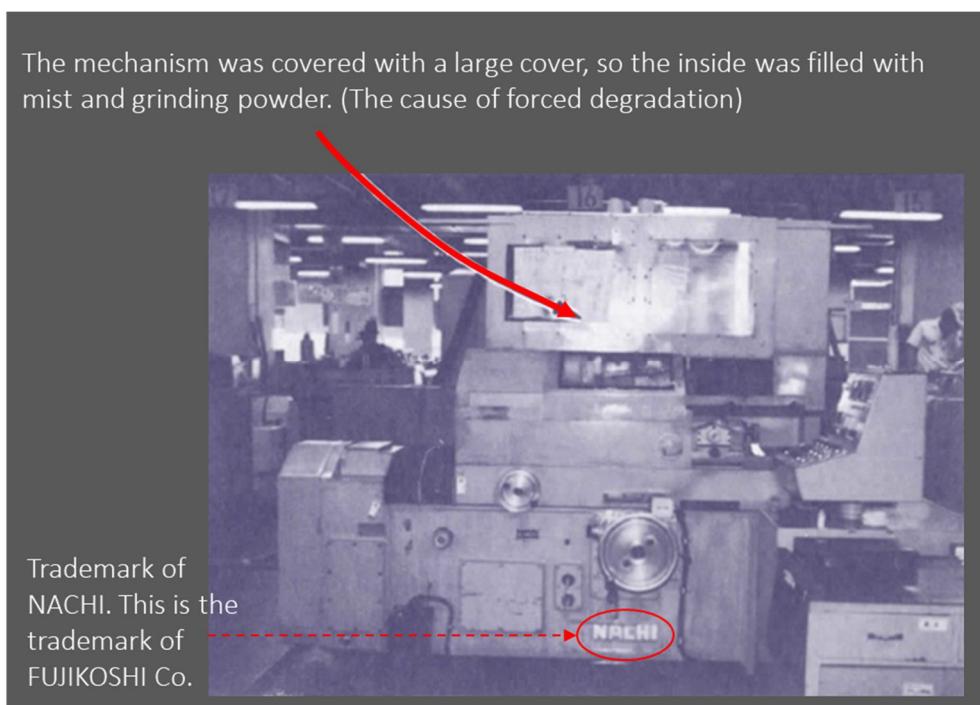
2. Worm grinding machine

I introduce an example of scattering prevention improvement which changed from large cover which covers the entire mechanism to box type cover which covers just generation scattering source.

In this example the teacher taught me 2 important things.

One is that we must never use the machine as it is bought. And it is necessary to add wisdom. This company also considered the quality, reliability workability and safety from the first. And the motto was (and is) "*Never use as it is and add wisdom*".

I introduce 2 photos. And these show the change of machine before and after:



This is an example of changing the idea of a large cover for preventing scattering that had covered the entire facility until now, and changing it to a compact box-type local cover.

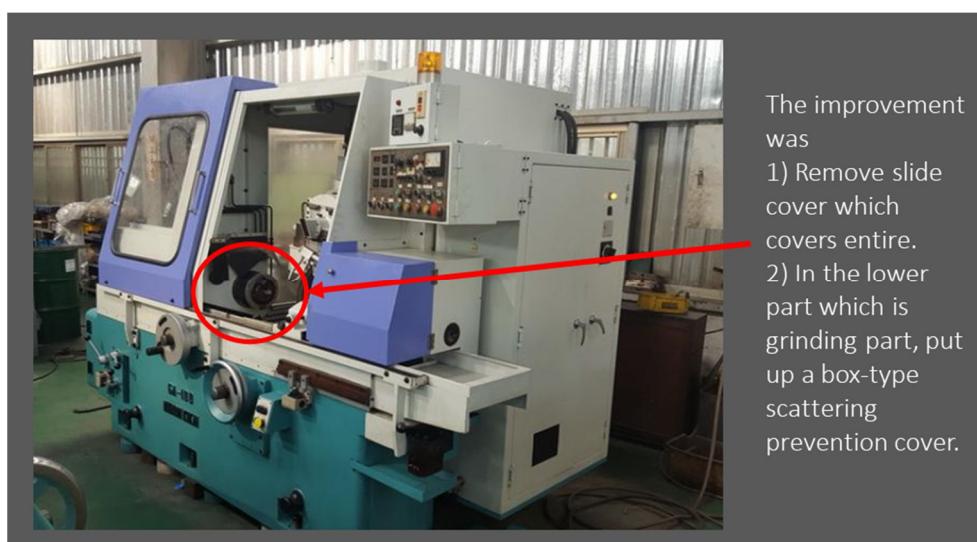
The large cover was filled with mist and powder during grinding, and entered the inside of the belt, coupling and limit switch as well as the sliding part of the machine, and everything was forcibly deteriorated. And

According to the teacher, the sudden breakdown occurred more than 5 times/month. This machine was very time-consuming machine.

For example, it took time and labour to open the door each time when attaching or detaching a workpiece or checking the grinding state. To make matters worse, even if we proceeded with Jishu-Hozen activities, it quickly became dirty, and maintenance of Seiso, Oiling and Inspection was almost impossible.

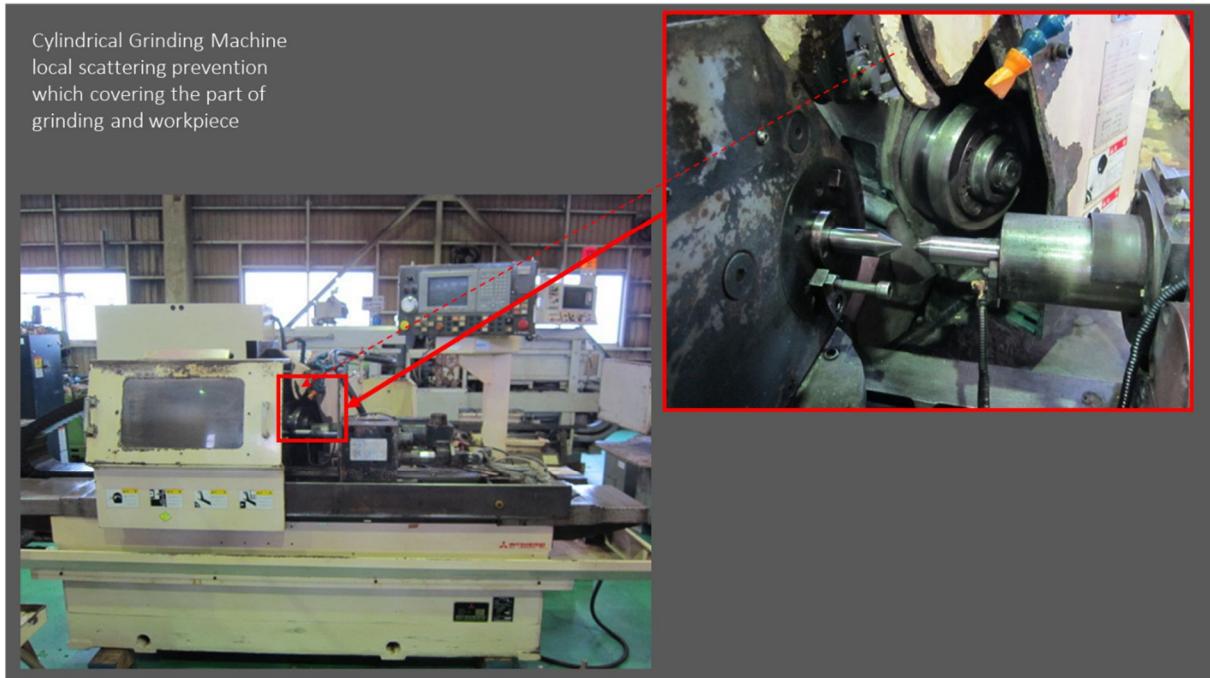
One of important thing was that this improvement was made by Gemba group members. And this box-type scattering cover was standardized as a wisdom of this Gemba.

Probably it is a little difficult to understand the structure of machine. Then, I searched similar machine in internet. Then I complement the above explanation:





3. Cylindrical grinding machine



I would explain the local scattering prevention cover with case of cylindrical grinding machine.

One day I visited a factory and saw one cylindrical grinding machine (photo of above).

The factory gave the importance to 5Ss. Then the factory was kept clean. When looking around the factory, the maintenance engineers had just finished the maintenance **Seiso** of this cylindrical grinding machine. According to the engineers, they make maintenance **Seiso** of this machine twice a month. And their problem was the dirt of inside of the cover.

Then I suggested an idea of local scattering prevention cover which covering the part of grinding and workpiece. One week later there was a phone call of thanks from the factory manager. According to him, they made a local cover and put up in the machine after some prototypes. The effect was good and daily maintenance **Seiso** became possible.

In fact, the concept of scattering prevention is still very rare even though in Japanese factories who intend 5Ss. And in fact, Japanese factories are cleaner than foreign factories. However inside of machines is still dirt which could be the causes of machine troubles.

Again, **Seiketsu** in 5Ss requires **Kaizen** activity to maintain other Ss. I never say difficulties. And always I make a question why you don't implement 5Ss for keeping factory management base condition and why you don't Maintenance **Seiso**. And continuously why you don't implement maintenance Seiso of inside of machine which there are the parts of main mechanism.

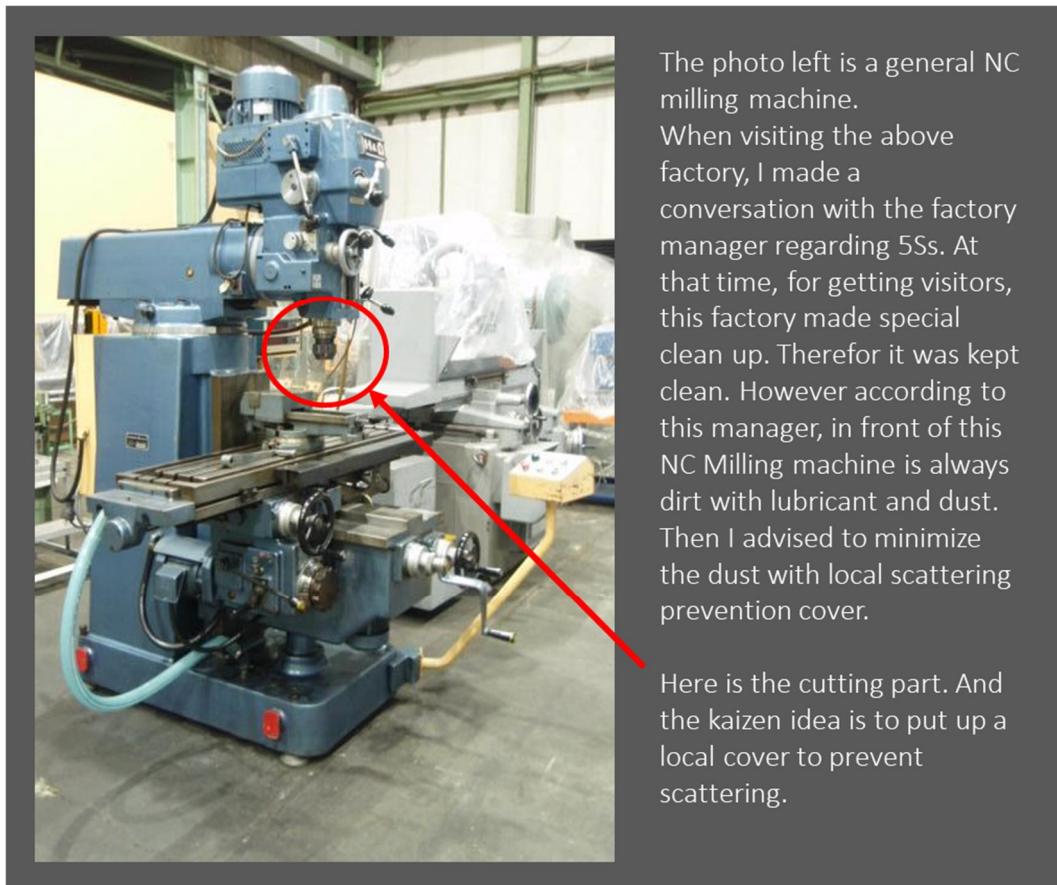
Japanese factories are clean and look like implement 5Ss at a glance. But inside of the machines are dirty. Foreign factories are generally dirty inside and outside of machines.



4. CNC Milling machine.

According to the manager, since the workpieces have a wide variety of shapes, dimensions, and materials, no scattering prevention or intrusion prevention measures have been taken, and cutting scraps are scattered not only in the machine body but also around it. So, like as there is no stepping on the foot. And.

For this cleaning it takes 30 minutes every day, and additionally cutting scraps entered into the lubricating oil tank, so breakdowns occurred several times a year. Then, I suggested next idea which is local scattering prevention cover and oil fence plate.

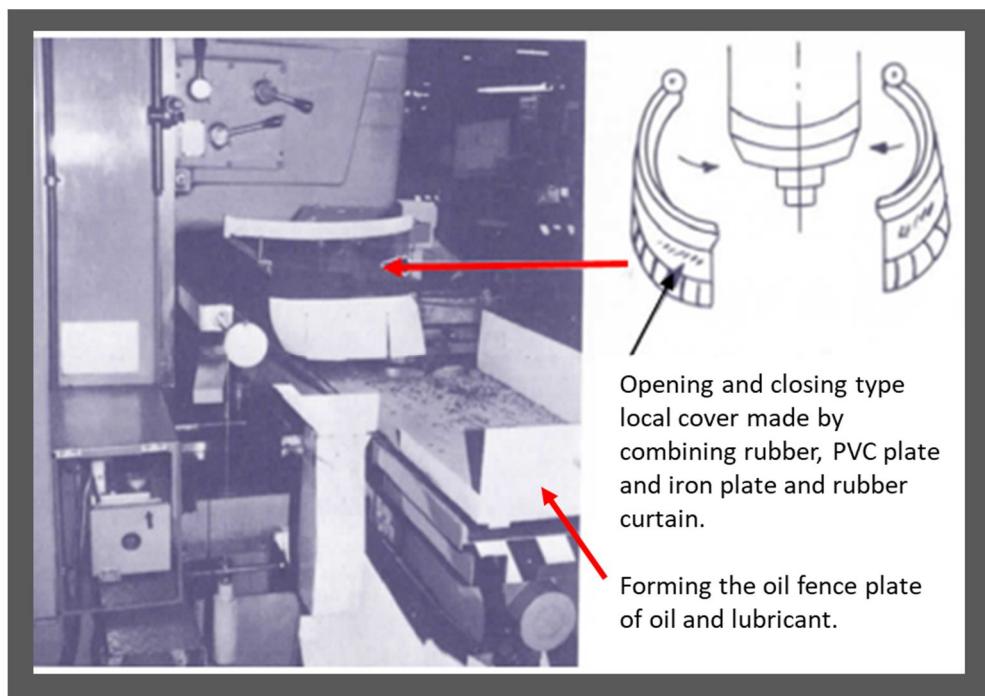


The photo below is given by my teacher long years ago. Anyhow the paper is very old and photo is black and white.

But I understand that such scattering prevention idea is still useful.

There are 2 good ideas. One is this local prevention cover. And, another one is oil fence plate idea. This oil fence plate is a little tall.

Then this oil fence plate can prevent the scattering and also control the flow of oil and lubricant. Also, this oil fence plate is detachable.



5. Oil fence.

You remember this photo which shows the overflowed lubricant and Sawdust on the floor. I don't like such situation. Anyway, I hate. Because it is dirty and not beautiful and above all it is danger (the working floor slippery).

The improvement of "controlling oil flow" in wet processing machine is similar to the concept of local scattering prevention. The idea is that the cutting fluid that flows back to fill the entire of oil pan of the machine will be routed with something like a silicone sealant in only a limited place (localize). By doing so, the cleaning time of the chips and grindstones accumulated in the entire oil pan can be shortened, and at the same time the appearance is improved. In addition, the amount of accumulated cutting waste can be reduced.

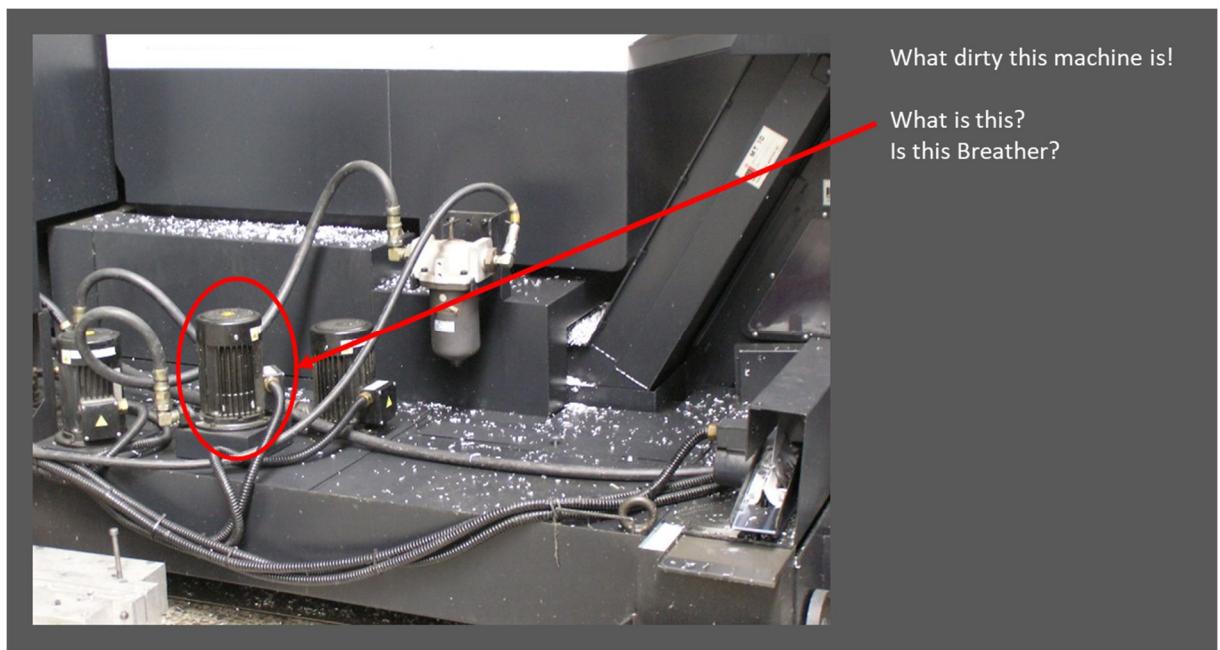


The concept of local scattering prevention.

I explained this idea. Unfortunately, this idea isn't popular, but rare. However, as I explained it is quite important and useful. And additionally, it is possible to implement with the level Kaizen idea.

The effects are remarkable. The effects are not only the beautification of working space as keeping 5Ss, but also maintaining the machine health and the lifespan.

Under the slogan "Localize prevention of scattering", we promote local cover improvement activities. By eliminating so-called forced degradation and changing to natural degradation, the number of failures will decrease significantly.



Now I finish the description of "Scattering Prevention".

And next I would write about Lubricant Control. And in that column, I will use above photo again.

IV. Teaching the company.

A little going back to the story of the company which I explain in the last lecture.

We agreed to take action for next themes.

- 1) Make Gemba Committee and Special project team.
- 2) Establish Management team and meeting.
- 3) Start all activity at once.

1) Establishment of the special project team.

At last, we could establish the special project team with overcoming various problems.

It was indeed unnecessary problems and some wasting time. But it might be acceptable for me, because these wasting time also were included in their payment to me... These are my voice in heart. From my notebook.

Again, the tasks of this project team were as below.

- 2) Investigation of current status in safety, sales, cost, productivity (machine, material, labour efficiency) and quality.
- 3) Study of necessary knowledge (such TQM, TPS, TPM)
- 4) Decision of TPM (if TPM is suitable) and study.
- 5) Target setting.
- 1) Making policy statement
- 6) Action plan.

In fact, 2) and 3) were implemented at once. And 4), 5), 1) and 6) were discussed at once. But I would explain their activity one by one.

Their period given was 6 months. And also, they were not allowed full-time activity.

Therefore, when I made a meeting with them, they expressed their concern whether it was possible to complete the task or not.

But soon their concern was dispelled by the leader's word: — We don't know the status of our company. And we now are afraid in a state of knowing nothing.

And that suggests that what we fear most of all is fear itself —she said, meanwhile I thought, at this moment, it was Excellent and she continued. — Let's start from knowing our company's status. And let's focus in to the problems of factory management.

2) Study of necessary knowledge (such TQM, TPS, TPM)

1. Studying the total ideal frame of factory management.



It is very natural method to make rough timetable in 6 months. But they didn't. And they started from knowing total status in studying and making presentation about their each and every department. The constitution of this project was 11 members. And, the leader was the accounting staff:

- Accounting: 1
- HR: 1
- Design Engineering: 1
- Production Engineering: 1
- Production planning: 1
- General affairs: 1
- Material control: 1
- QA: 1
- Sales: 1
- Maintenance: 1
- Gemba supervisor: 1.

It is quite good method to study the frame of factory management from the individual department job role.

But before this, I recommended to investigate my Factory Management Checklist⁵ to know total frame of ideal factory management system.

And the Factory Management Checklist is constituted of 11 categories which are: Policy Control (8), Organization and administration (9), Human resource Development (10), Information gather & Transmission and usage (8), Standardization (10), Cost Control (13), Factory Control (11), Production Control (10), Material Control (12), Quality Control (13) and Safety control & Work environment & Environmental Conservation (6).

They studied these 11 categories (and total 110 questions) with my lecture.

Then they checked their factories as a training and made presentation each other and discussion. With through this program they could learned and understand the frame of corporate and factory management.

2. To learn individual department



This project's constitution involved almost of essential departments. They introduced their individual department in presentation and simple paper.

⁵ The Factory Management Checklist shows the status which a factory should be and its ideal status:

<https://drive.google.com/file/d/1P58oJRZHwHqvRYf3kDUNUAHWNfBSUgzG/view?usp=sharing>

Their necessary presentation contents which it is possible to know the corporate function were:

- Division of duty and the contents of job role
- Data (kinds of data in figure)
- Relationship with production Gemba
- Current problems. And,
- Basic knowledge of each departments.

Firstly accounting (leader's department)

- Division of duty... (omitted)
- KPIs; There is no data which should give and feedback to production Gemba. And she expressed the lack of support to production Gemba.
- ...

She explained the trend of ROE (Return on Equity). When looking at the ROE, sometimes it was under 9% near to 8%. And, general criteria of sound profitability are ROE more than 8%.

Then, as they guessed, directors felt the crisis of less than 8%. This is the trigger of launch of this activity.

One by one the department's representatives made their presentation. And, they deeply discussed the management system from total in FM checklist and from individual presentation.

Let me please, omit the exact contents of these presentations.

3. To learn 5Ss & usage.

I required them to learn 5Ss. But I didn't make my lecture. Although I required to use my 5Ss checklist and, to use as a 5Ss training. In fact, there was no this base. Therefore, they needed to make their checklists.

A checklist should be embodied the ideal figure of factory management.

The project team and Gemba committee members studied the 5Ss checklists and made tentative factory check based on it. And, after this tentative check which is one kind of training and learning, they (project team and Gemba committee members) discussed the check items to modify as their checklists.

4. Self-study of TPS, TQM and TPM.

Again, they didn't be allowed their full-time activity. Therefore, they needed to make self-study in overtime. Fortunately, this company had some books. Based on these they made their self-learning. But again, members had a concern of time to understand these knowledges. Then the leader told them as next:

—Everyone—the leader told and in the meantime, I thought to myself this was excellent—. It is no necessary us to become the professional to these techniques.

But just we need to understand the concept & though, contents of techniques and possibility & applicability. Therefore, let's learn widely & shallowly.

Then she divided the members to 3 groups (groups of TPS, TQM and TPM).

- A. Each group made circle reading party.
- B. Each group member made presentation to share the knowledge internally (in the group).
- C. Grand meeting and each group made presentation to share the knowledge.
- D. Exchange the books and exchange the learning theme (for instance TPS to TQM).
- E. Repeated 3 times.

This method is recommendable to learn quickly. One of good point is to teach each other. To teach is best learning method.

Again, they didn't be allowed fulltime work for the project, but 2hours/day. Then their working was that 2 hours in working hours and 2 hours overtime working then total 4 hours/day.

3) KPIs.



1. KPIs

It was an urgent issue to know the current factory status.

They discussed necessary data for production Gemba and listed up. And, to investigate the current status, data is crucial. And to gather data it is necessary to establish the system. Also, it is required to implement gathering data as first priority. Because they needed to make an action plan and policy statement based on the scientific data within 6 months. So, they decided the items of factory management KPIs as next.



Safety status

- Number of Accidents with Medical treatment: It is necessary to leave from job for medical treatment.
- Number of Accidents without Medical treatment: It is necessary to make a treatment, but the degree is small and no necessary to leave from job.
- Number of days without accidents (of the month): Monthly cumulative record.
- Record days without accidents: Best record month and the number.
- Number of **Hiyari & Hatto** suggestion and Resolved in Gemba:
- Number of items resolved versus Number of suggestions of the month and also, accumulative of the year.



Human resource Performance

- Absenteeism rate
- Turnover rate
- Number of **Kaizen** suggestions
- Number of QC circle or Small group activity.

Sales record

- Total Sales in KMH: Sales amount in KMH = \sum Number of sales pieces x Labour Standard time
 - KMH: Thousand Labour Standard Hours
- Total Sales in \$
- Unit of Sales/KMH

Quality status

- Defect Rate: Total and individual product = (Total number of defective products ÷ Total number of products) x 100.
- Index of defect points = (Total number of defect points ÷ Total number of products) x 100.
- Direct Pass rate (example; 3 production processes) = Defect ratio (of 1st process) x Defect ratio (of 2nd) x Defect ratio (of 3rd).
- Customer's quality concerns.
- Number of concerns (of the month).
- Number of 0 concern continued Record: Number of interval days of 0 concern.

CSI (Customer Satisfaction Index)

- Number of customer's quality concerns and each area (Unit; Number).
- Ratio of Delivery Delay (Unit; %) = \sum Total number of delivery delay ÷ Total number of deliveries.
- Index of Delivery Days Delay (Unit; -) = \sum Total number of days of delivery delay ÷ Total number of deliveries.
- Ratio of Delivery Delay (Internal. As a material management, production Gemba is a customer.)

Costs

- Material performance
- Scrap Loss Rate (Unit; %) = Total weight of Scrap ÷ Total material weight
- Material yield rate (temporally use above Scrap Loss rate.)
- Material inventory Rotation Index: (Unit; Times) = Total material inventory ÷ Total Sales amount
- Labor Efficiency Rate (Unit; %) = \sum Number of products x Standard Hours ÷ Total labour working hours.

(Labour working hours; Real working hours and indirect hours not included. Indirect hours; meeting hours, 5Ss check hours etc. In the future indirect hours also should be included.)

- Quality cost = Inspection cost (Inspectors) + Repair (labour and material) cost + Inspection Instrument (and jigs) cost + Dealing cost of customer's quality concern.
- Total direct cost (Cost per KMH) = (Total direct labour cost + Transportation and packaging costs) ÷ Total KMH
 - KMH; Thousand SH: \sum Number of Production or Sales x SH ÷ 1000.
 - SH: Standard Hour.
- Total Indirect Costs (Cost per KMH) = (Total indirect labour and material cost + factory facilities cost) ÷ Total KMH
- Depreciation expense (Cost per KMH)

- Depreciation expense: Based on the tax law standards.
- Inspection Instruments and factory facilities are required to judge whether these are depreciation expense or not.
- Total production cost per KMH (Just relating to factory expenses.) = Total direct cost + Total Indirect cost + Depreciation expense.

Machine Performance

- Machine Performance Rate ($= \sum \text{Operative Hours} \div 20\text{days} \times 8\text{hours} \times 2\text{shifts}$)
 - Operative Hours: actual machine working hours
 - $20\text{days} \times 8\text{hour} \times 2\text{shifts}$ is the meaning of wished hours against the investment.
- Machine Performance Rate ($= \sum \text{Operative Hours} \div \sum \text{Planned Hours}$)
- Planned Hours:
 - Planned machine working hours $= \sum \text{Machine working hours} - (\text{planned stop} + \text{morning meeting} + 5S \text{ activity and others})$
- Machine Performance with Speed Rate ($= \sum \text{Number} \times \text{T/E: Speed} \div \sum \text{Planned Hours}$)
- Output/hour $\times \text{T/E. T/E} = \text{Output} \div \text{Standard Output/hour}$
- Breakdown Rate ($= \sum \text{Machine stop Hours in Breakdown} \div \sum \text{Planned Hours}$)
- Machine stop frequency Index $= (\sum \text{Number of Machine stop frequency} \div \sum \text{Planned Hours})$
- Changeover time $= \sum \text{Machine stop time for changeover} \div \text{Changeover frequency}$

There were the ideas picked up for knowing the status of factory management.

No, these were not their opinion, but my lecture. These are a standard of my previous company.

2. They fell in trouble.

Now they troubled. What shall they do now? Because there are too many items for investigating their corporate capacity.

Their opinions were almost summarized as next:

- Our theme is to introduce TPM. Therefore, necessary items just Machine Performance.
- Our target is to find the solution of profit recovery. And, TPM is only one of tool.
- Even though introducing just TPM, it is not possible to master it sufficiently. Because surrounding factory management circumstances are crucial to use TPM technique sufficiently.
- Actually, there is no capacity to implement all.
- This is another mission to establish the environment to gather such data.
- We have not sufficient time. No, not our time, but period of 6 months.
- What shall we do?

There were many things to gather factory management data.

For instance, one of fatal problem was standard time of each products. In fact, there were the phenomenon that when production Gemba getting a combination of product numbers, the labour and machine efficiency go up extremely. And there was the reversed phenomenon. It shows the incorrect SH (Standard Hours or Time).

For instance, **machine performance**: It was possible to gain the data of machine start and stop with machine itself. However, it wasn't possible to gain the actual time of machine work which the machine gives "the value" to the workpiece.

For instance, **others**: There was no concept of CSI. Therefore, there were no data and system to gather the data.

Then the leader told to them. —I have told, haven't I? —she asked figuratively and repeated—. We don't know the status of our company. And we now are afraid in a state of knowing nothing. And, that suggests that what we fear most of all is fear itself —then, he continued...

—Yes, we don't know our corporate capacity. Let's throw the question which it is possible to gather the data at each department. Because the gathering data is not our task, but their task and, at the end of the day, our task is to know the importance and necessity of each index and rate —he concluded.

At this point I need to clarify some points... Please understand that I'm writing the TPM introduction and stability. In this way, I taught necessary data for sound factory management. And, their first priority given was to introduce TPM.

By the way, I have a bitter experience which (I have written in somewhere) I was asked to introduce TPS (Toyota Production System) and failed to stabilize it. When teaching, as a usual way, I helped to introduce a model production line applied **Kanban** and **Pull** system. This teaching was very successful and got good evaluation and satisfaction of the client. However, I was informed by the friend, who was the accountant director, that the TPS introduction was a failure. The direct reason was that the techniques of the model line were not expanded to other. And basic reason was that this client company hadn't necessary **Corporate Constitution**.

What **Corporate Constitution** (which sometimes I call it corporate culture) is the complex of management skill, system and people's mind.

For instance, one of essential factor for TPM is **Jishu-Hozan** (Autonomous Maintenance by machine operators). And another case is, for instance, what **Kaizen** is? ...**Kaizen** is Autonomous Improvement by people.

In such company's case, I judged that this company hadn't necessary level of **Corporate Constitution**. No, not only this company, but also most of the client's companies haven't the sufficient capacity to stabilize the thought and technique. Then it is quite clear that the teaching might disappear very easily after finishing it.

What teaching of TPM (or TQM or whatever) is to help the establishment of proper **Corporate Constitution** with through the teaching of it, for instance TPM.

This company had some data and the gathering system such absenteeism, some efficiency calculations and quality. On the other hand, this company hadn't the systems of 5Ss check and Suggestion scheme, but understood the necessities.

4) Grand meeting.

After the lecture and confirmation of KPIs and also self-learning, they proposed to hold Grand meeting with directors, department managers and representatives of Gemba committees.

The purpose was to confirm the direction and particularly to start the data gathering.

But, before the grand meeting, I and directors made a small meeting and agreed upon the plan of operation of the grand meeting. And, it was on this way because I needed to give a warning to them and asked them not to speak their opinion, but just listen their talking.

1) Presentation by project team.

After project members explaining the current status of project activity very shortly, they proposed the start of gathering data by responsible departments.

And the leader required them their good understanding and said.

—Our project's aim or proposition is. Firstly, cost reduction in production process. Secondly Improvement of corporate constitution. Thirdly, TPM introduction, but as the means of above propositions —they tried to establish the basic premises—. And, we achieve the improvement of corporate constitution based on data.

—Data is imperative —she continued—. Activity without the background of data is reckless. And, just gathering data but no activity is stupid and Muda itself...

—We awaked how our office Gemba didn't corporate to production Gemba. For establishing the system of gathering data, it needs to ask the input effort by production Gemba —then she doubt just a little before calling into question his capacity—. Although computing system is improved, but still it is necessary the effort of production Gemba....

—We promise processing raw data and create necessary KPIs. And, we orient the activities based on data. Then, we evaluate and confirm the effects with data.

They explained the ideas of KPIs one by one. So, this data gathering required a reconstruction of current system including computing system.

All attendees understood the importance of data gathering and use of data. However, so many. There were too many data gathering items.

— Can you process enormous raw data and create KPIs? —The accounting manager (who is boss of this project's leader) concerned about the work volume and confirmed to her.

—We discuss with Data processing department —she said showing a smile—. And most of raw data processing is by computer. We are required to create **Kaizen** ideas to reduce cost and it is required scientific evaluation —she pointed out especially the word “scientific” and she continued...

—We made improvement ideas as action plans. And we experienced and knew that past action plans were not so effective to achieve the targets...

—Also, we felt that the approaches were not scientific and there was no support with back data. We were given this opportunity to create action plan and ideas to realize the proposition. Then, we will calculate the effect of ideas one by one and decide the priority of improvement ideas to concentrate our capacity...

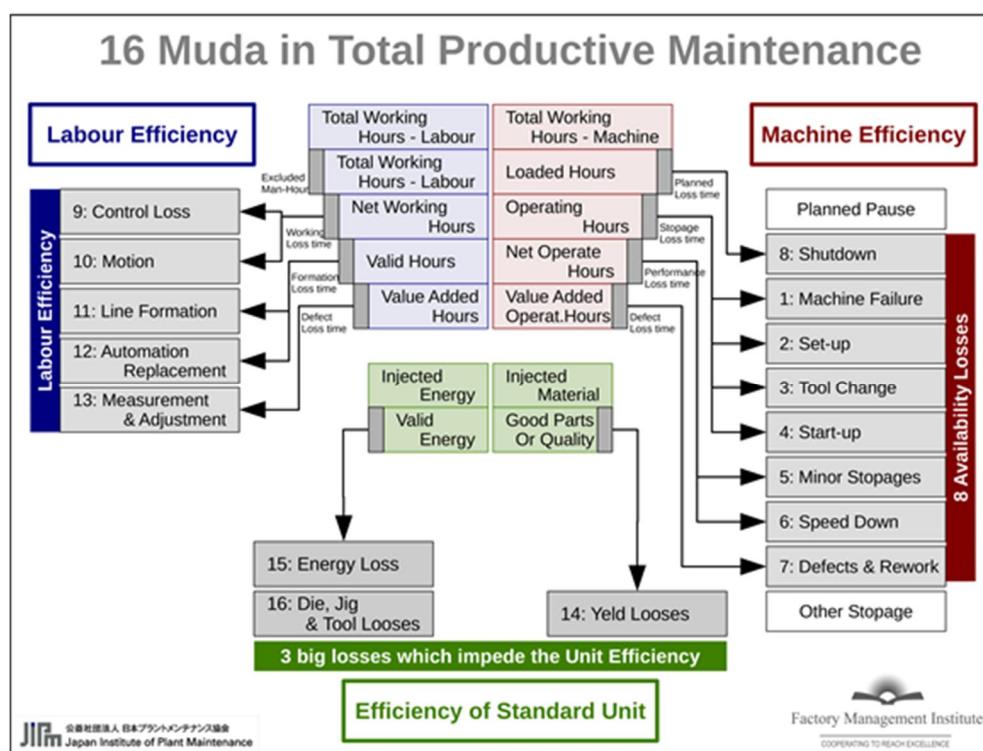
—How? —she asked figuratively—. For instance, we provide statistic data about 1% of efficiency: how much of cost reduction? And 1% of defect ratio: how much of repair cost and scrap? Also, 1% of material scrap reduction: how much of cost reduction? —she doubted just for a moment her long list of indicators and continued...

—Material turnover: How many days inventories and how much of inventory cost? Or the 1% of Machine Operation Ratio: actually, it doesn't relate to cost reduction directly because of fixed cost, but fluctuation of production in sales relates to the overtime work opportunity. Even, 1KMH budget cost: How much cost of 1,000 hours standard cost. Etc.

2) A doubt expressed by a director. And, debate of TPM introduction itself.

—How about the progress of TPM introduction? — when one director questioned meanwhile one voice in my mind was telling me... What a stupid question! Even although we made the small pre-meeting,

Again, she said —Our project's aim or proposition is: Firstly, Cost reduction in production process. Secondly, Improvement of corporate constitution. And thirdly, TPM introduction, but as the means of previous propositions —she explained again patiently—. And TPM is just one of means for realizing 1) and 2). And we guess we introduce TPM for improving machine performance. But —she made a pause to point out the next sentence...



—We have a doubt whether machine performance improvement is essential or not important for the propositions. Because most of the machines are fixed cost and are the objective of depreciation. Therefore, whether machine performance to be good or bad, there is no relation to current cost.

Other project member took over her word and expressed their intention.

—Our aim is to reduce cost in production process and improvement of corporate constitution. And TPM is only one of means for machine management —he said and continued— Even if introducing TPM, the effect of cost reduction is small or restrictive.

—Even if improving machine performance, if no increasing output in total, the machine performance improvement itself cannot have the meaning. So, the meaning of output in total is sales amount.

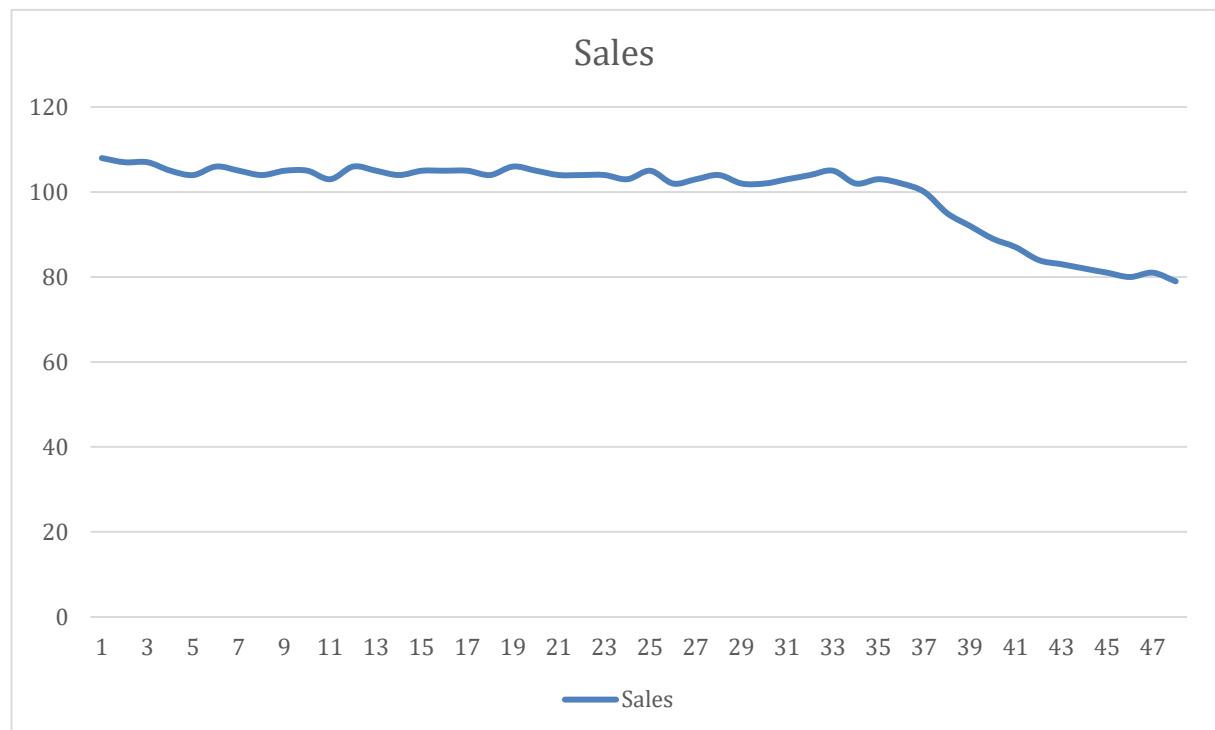
At this moment I would face his doubts to TPM introduction for cost reduction.

Does TPM not contribute to cost reduction?

They continued their presentation and said: —Please excuse us. Because we are learning the methods of cost reduction and investigating corrective direction. We had doubts when looking at next picture in a book —and she pointed out the above figure—. There is the item of "Machine efficiency".

—Even if improving machine efficiency, we don't think that it is possible to reduce production cost without the item "7.- Defect and Rework" which is quality issue and relate to material cost and labour cost.

—We never deny the importance of TPM introduction and machine efficiency. But —they expressed their doubts—. We think that it is necessary one condition for expectation of cost reduction in implementation of TPM. And, this is the increase of sales amount.

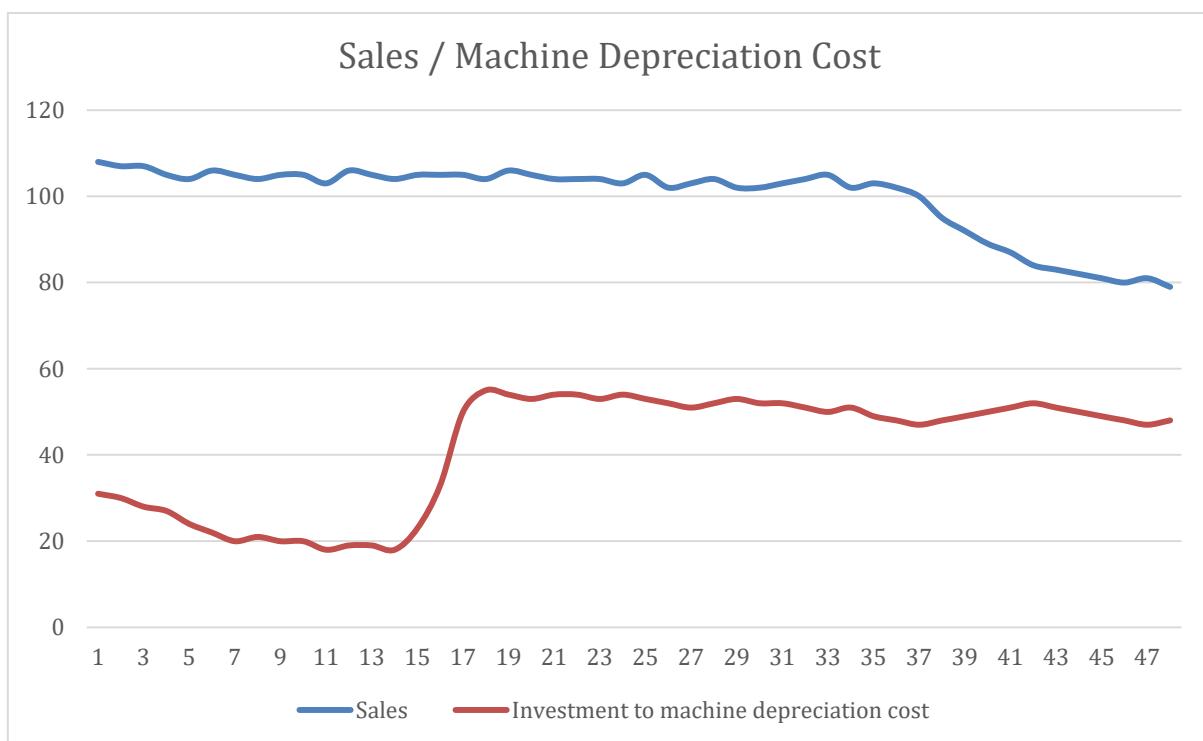


—Please look at next graphs. The first one is the trend of Sales/Month. 4 years trend show the average of Sales/Month. And, recent one year shows monthly base trend.

—As you know, there was no increase of Sales/Month from past 3 years. Obviously, latest one year these was no increase in monthly trend, but trend of decrease. It is the meaning of no remarkable increase of output...

—No increase of output in total. But the machine depreciation is occurred in natural —and they clarify—. Another word, whether we improve the machine performance or not, there is no relation to cost reduction, because of no **Output increase...**

—Please, look at the next graph which shows the trend of investment to machine depreciation cost which is involved new machines purchasing and increasing of spare parts cost...



—Also, as you understand, we purchased 2 new machines at 2006 September, three years ago. And, is quite natural, the amount of depreciation was increased. However, on the other hand the Sales/Month trend didn't rise relatively...

—We know the financial crisis of Lehman (called Lehman shock) at 2008. But after this crisis, unfortunately our sales output didn't show the rising trend and shows low level...

—We believe that you know these management risk. But still we need to make clear these truces for why TPM introduction is.

Our aim in TPM introduction is to establish JIT machine condition.

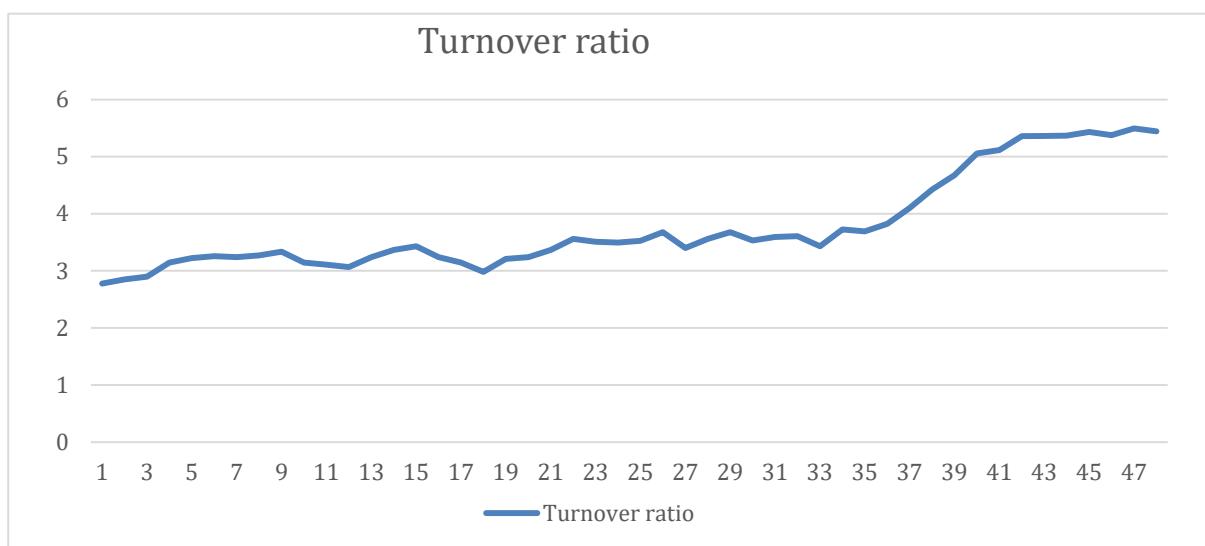
— Our aim in TPM introduction is to establish JIT machine condition and, this is the why we will introduce TPM —she summarized and concluded regarding TPM introduction concept, and so they said—. The activities are same, but just we wish to confirm the thought of TPM introduction as to seek "Just In Time Machine Condition".

—The thinking of JIT Machine Condition is as you understand: “It is that necessary machines exert best performance at necessary time”. And, the point is **the necessary machines** —they continued—. But if there are unnecessary machine, we would suggest to sell these to reduce depreciation amount or use in bad performance.

Their presentation to be continued...

Material efficiency.

Please look at next graph which shows the trend of inventory turnover ratio: **Total material inventory ÷ Total Sales amount of month**. This ratio trend shows the inventory level getting worse and 450%.



—As you understand we have 4 months and over inventories against sales amount of month — they said showing kind of worry expression on their faces...

—**We were surprised** because when investigating the inventories, the raw material inventory level is 3 months or less. Of course, as you concerned, 3 months inventory level is too high. Moreover, there are many excess articles of work in progress (WIP) which were produced with machines. The line shows excess production by machines...

—In such circumstances it is not possible to make cost reduction even if introducing TPM —they asserted and tried to explain just a little bit further...

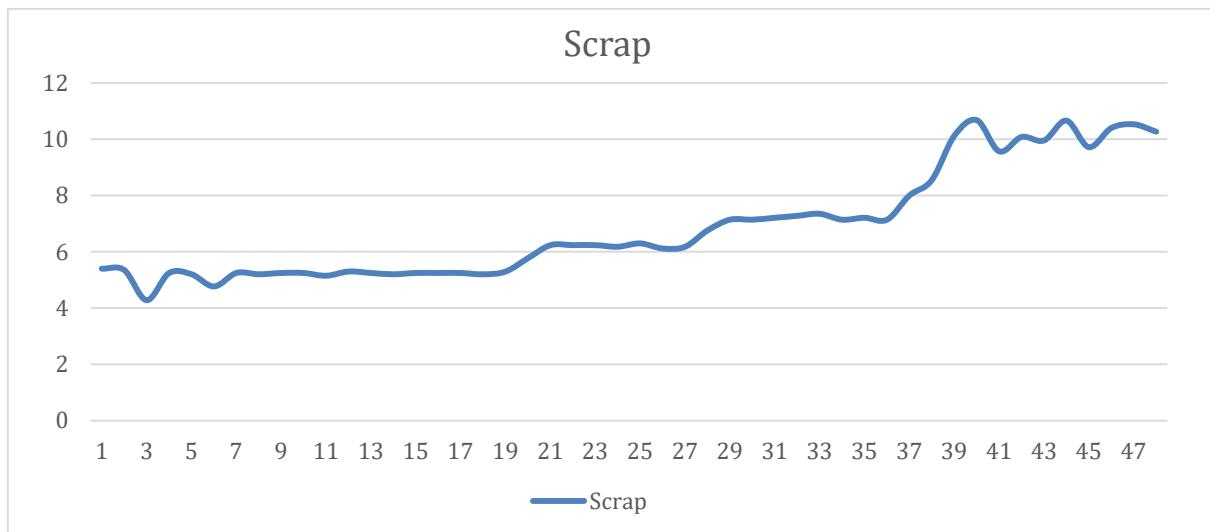
—Sometimes Machine Cost is calculating as: —then they started to write on the white-board the next formula— **Machine cost: Depreciation (machine cost) ÷ Output (number of pieces)**. —when they finished, they shook their heads— But... we think that it is wrong. The Output must be changed to **Output sold...**

—As machine cost (depreciation), there is no difference between the situation of one-piece production or 10,000 pieces. But of course, if these are sold as products, it is possible to relate to production cost. Unfortunately —they showed an expression of helplessness...

—Our company fell into the situation of excess machine capacity —they sadly recognized...

—Please look at next tentative graph which shows recent scrap loss from accounting data. Scrap losses have been occurred in unspecified...

—It shows the Muda of excess production. And unfortunately, we need to say that some of these excess productions became obsolescence and dead stock. In such condition we cannot find the meaning of introduction of TPM.



—Moreover, the excess machine capacity is causing the excess production. The excess production causes the excess inventory. The excess inventory causes the increase of scrap losses.

—These are still tentative investigation. However, we may request the reduction of machine capacity and sell some excess machines to reduce depreciation or again use in bad performance intentionally.

—We never deny the importance of TPM introduction and stability and intend to introduce it. But in parallel, —they insist— we need to challenge to provide basic factory management which includes the method of production planning and order.

—**Why many inventories of work in progress articles occurred?** —they asked figuratively, because, of course, they did not expect a properly reasoned answer.

—We found the cases of that unnecessary quantity of production order was made to move machines to count the number of output of pieces. And, sometimes production orders were made for the purpose to move the new machines.

—Then, please understand and accept the concept of TPM introduction which is:

- "Just In Time Machine Condition". And;
- Necessary machines exert best performance at necessary time.

—This concept is crucial to seek slim management and TPM is the base.

Then I thought by my self that now the word of "lean" is nowadays popular. But some time ago and, at that time, I had been using the word of "Slim management" for almost same meaning of "lean". But now, let's continue the presentation of "Material efficiency" just a little more thoroughly...

—As we highlighted the inventory situation, there are many scrap losses also excess inventory. And we need to investigate more deeply. Then we suggest to introduce a tentative inventory level standard which is:

- No movement for 6 months and over; Obsolescence or dead stock;
- No movement for 3 months and over; excess stock;
- No movement less than 3 months; Normal.

—And based on this, we separate the current inventory in 3 areas. The purpose is to clarify the 6 and 3 months no movement inventories. The purpose of this separation is to plan the treatment of obsolescence & dead material and identify & improve the real material turnover ratio:

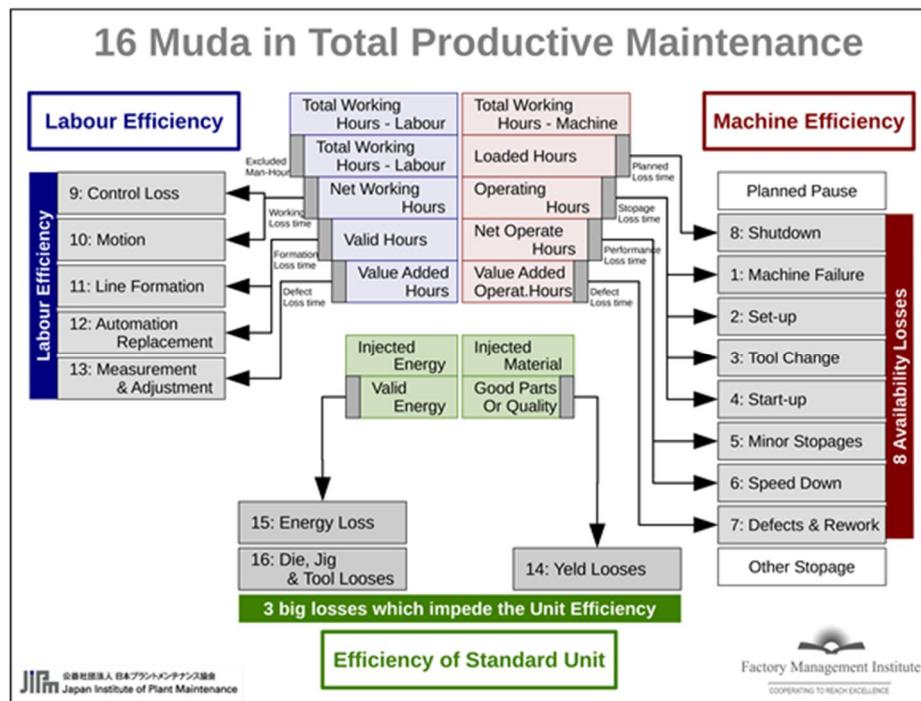
$$(\text{Total material inventory} \div \text{Total Sales amount of month})$$

—And, Design engineering, Sales and Material departments start to judge Obsolescence and dead stock in the 6 months no movement stock to treat them...

—And also Design engineering, Sales, Production planning and Material departments started the discussion of New parts and Old & suspected Dead parts information system...

— When looking at the material efficiency, material scrap in machine area also must be highlighted.

3) Labour efficiency. Even if improving labour efficiency, no reducing cost?



In this diagram, there is the item of labour efficiency also. And, labour cost also a fixed cost. Please look at next graph which shows the trend of recent labour efficiency (internal) and labour efficiency tentative calculation against sales. We calculated the efficiency from actual sales (output standard KMH) and actual labour input time of same timing.

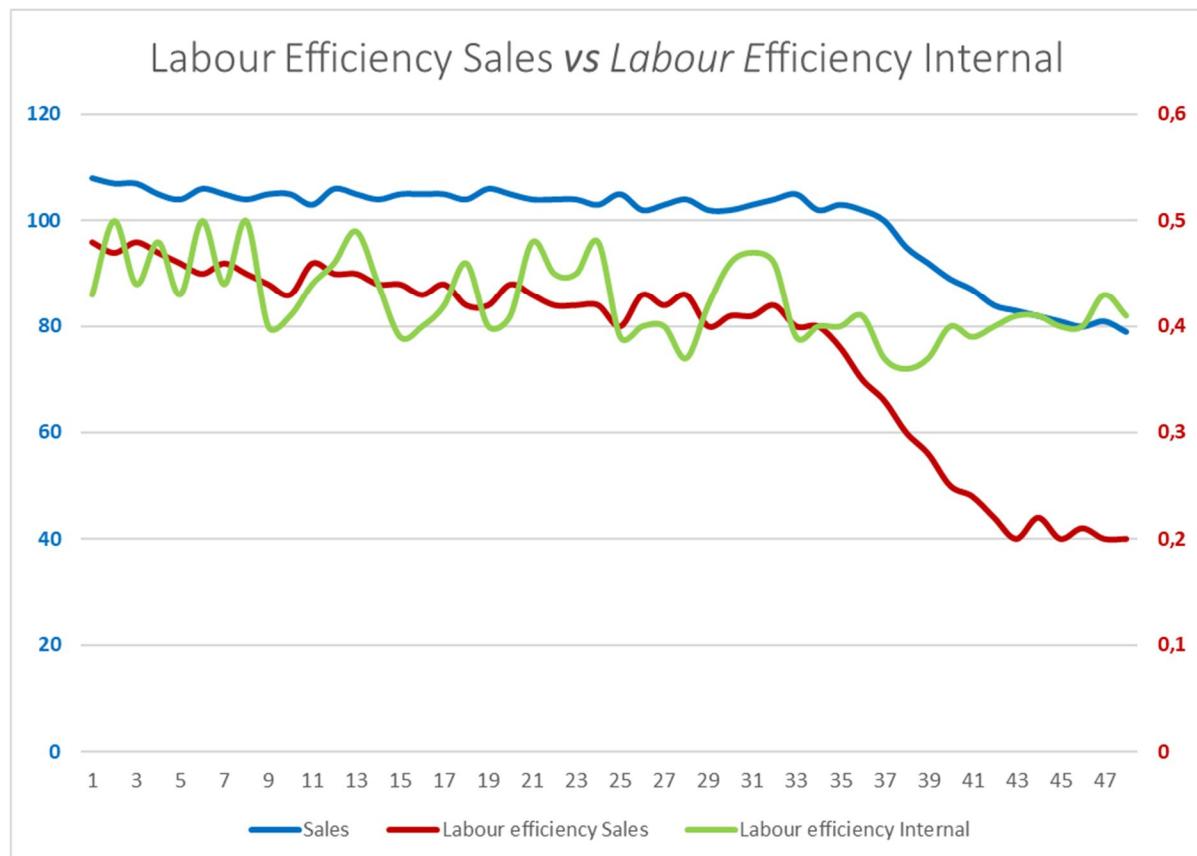


Labour efficiency from sales (output standard KMH) =

$$= \sum \text{Sales KMH (thousand standard hours)} \div \sum \text{Actual labour input time}$$

Both of them there are monthly fluctuation (up and down). But the trend shows clear difference. Labour efficiency (internal) is higher than efficiency from sales (output standard KMH).

$$\text{Labour efficiency (internal)} = \sum \text{Production KMH} \div \sum \text{Actual labour input time}$$



— Before the Lehman shock at 2008 the efficiency internal and efficiency for sales were balanced. But after Lehman, in order to supplement the excess of labour capacity, the production orders were made by production planning department. This efficiency difference between internal and sales, emerges in the inventory as excess finished products and the obsolescence. And, as you know, even if efficiency goes up, if sales don't go up, costs won't go down...

—From now we will not have the production plan for keeping job and fake efficiency of production Gemba —they said...

—We asked the introduction of tentative inventory level standard for raw materials and work-in-progress. And we will standardize same inventory level standard for finished products to identify the obsolescence & dead stock and normal stock. It is not an era of which producing and storing and to be possible to sale...

—We said "fake efficiency". Excuse us too much, perhaps it was overstatement —they recognize to all the meeting—. And, we will use the current labour efficiency as one of KPI. Additionally, we will introduce the labour efficiency against sales amount...

—Now, one of important aim is to reduce cost in production process —they pointed out.

LABOUR EFFICIENCY SALES (LES)



$$\underline{LES} = \frac{\sum \text{Sales KMH (thousands standard hours)}}{\sum \text{Actual labour input time}}$$

Labour efficiency = $\frac{\sum \text{Production KMH (thousands standard hours)}}{\sum \text{Actual labour input time}}$

— We will provide, also, an action plan to reduce cost which include labour efficiency improvement. Of course, it is crucial to increase sales amount. But this is no our aim. We concentrate to improve internal efficiency improvement...

—It's a question of what to do with those people who will be eliminated from production line. It is quite clear that excess machines should be disposed or sold or again **use in bad performance**. But —they turn more serious in their speech—, personnel is not easy and never treated like as excess machines. Excess machine can be sold or disposes. However, personnel must never be treated like as excess machines...

—We who are included Gemba committee and office committee members are one team. And, we understand and share the mind of improving factory performance with reducing cost for the survival of our company —they expressed meanwhile the rest of the directors said with a slight nod.

—We will produce the action plan backed by numbers. Into it they are included:

- (1) Machine performance improvement in the JIT machine condition concept;
- (2) Inventory performance improvement. Treatment of obsolescence & dead stock.
Production schedule method improvement;
- (3) Quality improvement in machine process and scrap and repair cost reduction.

—We limited the range of our activity to just machine process related, because of the time given.

—Initially for such aim, total quality improvement, labour efficiency improvement and total material efficiency improvement must be involved. But those activity will be given to next which is the TQM activity.

—Of course, the machine related activity involves the issue of labour and material efficiency.

4) Machine used in bad performance.



Sorry for bad title, but the meaning is that: "*Machines performance don't increase, but use them usefully*".

—Again, we confirm next issues:

- Machine capacity is in situation of excess capacity against sales trend.
- Machine performance improvement doesn't contribute to cost reduction, (if sales amount doesn't increase).
- Our TPM concept which we got your agreement is "JIT Machine condition"
- One of idea to reduce cost is excess machines to sale or dispose.

Excess machines to sale or dispose.

—It would be true that financial loss will be occurred. The loss calculation is:

$$\text{Loss} = \text{Book value} + \text{Cost for sale} - \text{Sales value}$$

—And, if the Sales value is larger sum than Book value, it is possible to gain extraordinary gain. But probably it would not be able to gain in this case. Therefore, we need to accept extraordinary financial loss for the case of machine sale...

—Of course, in the case of disposal, we need to accept the extraordinary financial loss:

$$\text{Extraordinary financial loss} = \text{Book value} - \text{Estimated price of scrap}$$

—Therefore, our project recommendation is to use these excess machines for minimizing production lot size. And,

- a) Again, we have excess machine capacities.
- b) We have confirmed Muda of excess production in inventory situation.
- c) We need to escape from the style of "Make to stock" to "Make to order".
- d) To realize "Make to order", it is necessary to shorten production LT.
- e) Then we concentrate to JIT Machine condition with TPM and Changeover time reduction in production line including machine process.

—We know the effort of sales department to expand sales amount. But we dare put our basic premise as that sales will not increase any more. Then, we tell everyone in this premise that:

- a) Machine performance will not improve even if introducing TPM. Conversely.
- b) Machine performance will go down. Because,
- c) We plan to reduce production lot size smaller to realize short LT and "Make to sale" and to eliminate over production which is the cause of obsolescence & dead stock.
- d) Labour efficiency (apparent efficiency) will not improve, but worsen, because of changeover frequency increase for smaller lot size. And, It is true labour efficiency will not go down in the condition of same sales amount.
- e) Cost reduction effect will be limited, because the limited effect in material losses reduction.

Machine performance in KPIs.

They, the project members, explained the relation of machine performance in next KPIs. Even actually, this company didn't start the data gathering at this time.

- Machine Performance Rate; To evaluate the efficiency of machine investment.**

$$\text{Machine Performance Rate} = \frac{\sum \text{Operative Hours}}{20 \text{ days} \times 8 \text{ hour} \times 2 \text{ shifts}}$$



- Machine Working Rate; To evaluate the efficiency of machine work against planned hours. To make effort to improve for JIT Machine condition.**

$$\text{Machine Working Rate} = \frac{\sum \text{Operative Hours}}{\sum \text{Planned Hours}}$$



- Machine Performance with Speed Rate (MPwS); To evaluate true or possible machine capacity. To make effort to improve for JIT Machine condition.**

$$\text{MPwS Rate} = \sum \frac{\text{Actual Output}}{\text{Logical Output}} \times \text{Machine Working Rate}$$



- Breakdown Rate; To evaluate the health of machine and Machine stop frequency Index; To evaluate the health of machine.**

$$\text{Breakdown Rate} = \frac{\sum \text{Machine Stop Hours in Breakdown}}{\sum \text{Planned Hours}}$$



$$\text{Machine Stop Frequency Index} = \frac{\sum \text{No. of Machine Stop Frequency}}{\sum \text{Planned Hours}}$$



Changover time; Changover frequency will be increased. And, to keep better machine performance.

The image shows a handwritten mathematical formula on a dark background. The formula is:

$$\text{Changeover average time} = \frac{\sum \text{Machine stop time for changeover}}{\text{Changeover frequency}}$$

At the top right of the slide, there is a small logo featuring a stylized 'K' and some other symbols.

5) Conclusion of this meeting.

—We wouldn't be able to improve cost in current sales situation, but would be able to improve corporate constitution which are:

- Improvement of "share the sense of value and all people's participation" with Gemba.
- Shortening LT and changing manufacturing style "Make to stock" to "Make to order".

—Then, please give us your answer. Shall we continue this project? ... Or shall we stop it, because our activity cannot contribute to immediate cost reduction —they asked finally.

To be honest I have to clarify one aspect of the meeting about the bewilderment of Management of management... So, the management team was confused not a little. Because three reasons. Firstly, is although it was tentative data, they made the presentation in hitting heart. Secondly, cost reduction and profit recovery are limited (in just material loss reduction) even if introducing TPM. And thirdly labour efficiency is hopeless in current status of labour turnover, if not increase sales amount.

In this way this project activity story will be continued in next.

V. Next Lecture

I will describe the continuation of this project team and oil & lubricant control.

Koichi Kimura CC4 – October-2019.